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ACTUAL FITOSANITARY PROBLEMS OF CULTIVATED DAHLIA PLANTS AND OF TUBEROUS ROOTS STORED OVER WINTER

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Abstract

More or less serious diseases affecting dahlia plants can be caused by three categories of microorganisms: fungi (mycoses), bacteria (bacterioses), viruses (viroses). In recent years, the most serious problems have been caused by bacterioses, due to the fact that some pathogens not only destroy plants, but can remain latent in the tubers for a long time, constituting a permanent threat of an epidemic (Vlad I.,2011).

Key Words: dahlia variabilis, tubers, pathogens.

INTRODUCTION

When the ventilation and temperature conditions for the storage of tuberous roots are unsatisfactory, there is a risk of developing tuber rot and recording great material losses (Zaharia D., 2004).

Some pathogens in this category not only destroy the plants but can remain latent in tuberous roots for a long time, constituting a permanent danger of triggering an epidemic (Şelaru E. 1989).

MATERIAL AND METHOD

The experiments were conducted in 2015-2017 in Sîntandrei, Bihor County.

The working hypothesis was that we can achieve production performance and economic efficiency by using healthy tuberous roots and ensuring a properly disinfected substrate and a favourable microclimate by providing uniform and effective shade in May-August.

We used tuberous dahlia roots stored over winter in the Sîntandrei storage room.

They were planted in the greenhouse on 15 March 2015, 12 March 2016 and 18 March 2017, at a distance of 80 cm between rows and 50 cm per row.

The experiment included 5 variants. Each variant occupied 40 m^2, i.e. 100 plants.

RESULTS AND DISCUSSIONS

Table 1 shows data on mycoses affecting the dahlia plants in the Sîntandrei (Bihor) greenhouse, whose tuberous roots were stored over winter in the storage room. Moreover, the table shows the attack symptoms and the treatments to combat them.

Table 1

Dahlia mycoses, Sîntandrei, 2015-2017

Pathogen	Disease	Damage location	Symptoms	Control
Botrytis cinerea Pers.	grey mould	cuttings, tubers, flower heads	grey fuzz tubers rotting in storage	satisfactory ventilation spraying with: captan, iprodione and vinclozolin alternatively
Entyloma dahliae Sydow	-	leaves	Oily spots, which become brown-grey, more or less circular	vapour disinfection of the substrate spraying with captan (125 g/hl solution)
Erysiphe cichoracearum D.C.	powdery mildew	leaves, petioles, stems	white, powdery spots	-
Fusarium sp.	fusarium wilt	stored tubers	deep brown spots	Formaldehyde 5% (1/2l/m^2) Low temperature storage
Pythium de Baryanum Hesse	collet black rot	cuttings, young plants	black rot on the collet	thermal disinfection of the substrate (90^0C for 10 minutes) satisfactory drainage
Rhizoctonla salani kuhn	collet brown rot	cuttings, plants	brown rot on the collet	thermal disinfection of the substrate (90^0C for 10 minutes)
Sclerotinia sclerotiorum (lib.) de Bary	cottony rot	base of plant	mycelial whitish fuzz and brown blackish sclerotia	reducing the humidity substrate disinfection with Quintozen (800kg/ha) crop rotation
Verticillium alboatrum Reinke et Berth.	Verticilium wilt	plant	wilting	substrate disinfection crop rotation sanitary selection of tubers

The dahlia mosaic virus is the most serious and most frequent virosis in this species. The affected plants remain dwarfed, presenting very short internodes. The deformations that the leaves suffer are typical, and the pale-green colour that appears along the veins strongly contrasts with the intense green of the rest of the leaf.

In order to confirm the diagnosis, we carried out a histological examination. In the case of the infection, we observed some spherical or ovoid inclusions called "X bodies" close to the nucleus in the affected tissue cells, which can be coloured with trypan blue.

Natural contamination occurred mechanically or due to aphids (up to now, at least 3 species of aphids have been involved).

The biological cycle of the virus is characteristic, inducing long periods of symptom disappearance, during which some affected plants can even be restored. In this situation, the virus is very hard to detect in the tissues. The plants which no longer show any symptoms remain carriers of numerous viral particles and therefore constitute a permanent threat of contamination to neighbouring plants.

Extremely frequent in the dahlia is also the tobacco mosaic virus that causes chlorosis and dwarfing. The leaf base becomes abnormally long and narrow with a deep toothed edge. Natural contamination was caused by aphids.

The virus appears in the form of arabesque lines that either showed up in concentric rings, which subsequently became necrotic, or in the form of an oak leaf.

Transmission from one plant to another is most often done by thrips.

Viruses have also spread because new, infected cuttings have always been taken from the tuberous roots of sick plants.

Currently there are no physical or chemical methods that can cure the infected cells without doing irreparable damage at the same time.

Therefore the only effective measures have been of prevention. Among these measures, the sanitary selection, the basics of which are the same for preventing both mycosis and bacteriosis, remains the main instrument.

Meristem growth is of real interest in combating dahlia viroses.

In recent years, bacterial damage to dahlia has reached worrying proportions. In France the typical soft rot symptoms caused by Erwinia chrysanthemi was observed on all tuberous roots used for propagation only in 2015.

The main bacterial diseases in the dahlia were: Agrobacterium tumefaciens, Coryrebacterium tumefaciens and Erwinia chrysanthemi.

During the first attack phase, Agrobacterium tumefaciens produced a glass-like tumour tissue with an oily gloss. The colour of this tissue then turned darker, and the tumour formation increases in volume. Within 3-6 weeks, the tumour tissue evolved to irreversible disintegration and led to tumour breakage, allowing its penetration and settling in the soil.

Corynebacterium tumefaciens caused new formations of cavernous shoots with short internodes at the base of the stems, with deformed leaves most often stained by anthocyanins in pink-violet. Recent research shows that this bacterium secretes cytokinin-like growth-enhancing substances. They stimulate the cell division of buds in the collet area, producing the brutal development of the shoots by giving them a cauliflower appearance (Selaru, 1996).

Inoculated in the stem 15 cm above the collet, the bacterium reaches the tuber within 15 days (Grisvard, 1994).

The Erwinia chrysanthemi pathogen completely destroyed the tuberous roots in the dahlia, being the most harmful bacteriosis. The affected tubers have a greyish brown colour and an unpleasant odour. The disease evolved rapiLSDy and the contaminated tuberous roots produced a reduced number of shoots that were shorter and darker than normal shoots.

Inoculated in the stem 20 cm above the collet, the bacteria took only ten days to reach the tuberous roots (Grisvard, 1994).

Table 2

Effect of treatments on disease attack in dahlia (average values 2015-2017) Sîntandrei

Variants	Number of attacked plants		±	Difference significance
	Plants	%		
V1 – thermal disinfection of the substrate (90^0C for 10 minutes)	5	5	92	***
V2 – substrate disinfection with Formaldehyde 5% ($1/2l/m^2$)	40	40	57	*
V3 – crop rotation	50	50	47	*
V4 – Foliar treatment with Benlate 0.1%	30	30	67	**
V5 – untreated	97	97	3	-

LSD 5% - 33; LSD 1% - 55.51; D 0.1% - 91.6

The data in Table 2 was obtained following the treatments and measurements on 100 plants during the 2015, 2016 and 2017 vegetation periods.

The table shows that thermal disinfection of the substrate at 90^0C for 10 minutes reduced the attack to 5 out of a hundred plants, with a very significant difference from the untreated control sample (V5).

At the same time, foliar treatment with Benlate 0.1% reduced the attack to 30 out of a hundred plants, with a distinctly significant difference from the control sample.

Disinfection of the growth substrate with 5% formaldehyde using 2 l of solution per m^2 and crop rotation (V3) reduced the attack with a significant difference from the control sample (V5).

CONCLUSIONS

1. Because there are no resistant dahlia varieties and chemical control is not effective against bacteria and especially viruses, the best results can be obtained by using preventive methods.
2. Correct disinfection of pots, crates, fences, pocket knives, scissors and even of the growth substrate has yielded good results.
3. New substrates for mother plant culture and rooting of the cuttings will be used in protected areas and the plants in the field will be rotated properly.
4. The health state of the plants will be permanently monitored.
5. Sick plants are to be removed and burnt.
6. The listed measures are an absolutely necessary but not sufficient condition, because there are periods of latency during which the symptoms simply disappear both in the case of bacterioses and viroses. During these periods, only laboratory methods (such as serology) can solve the problem of detecting pathogens and obtaining healthy plant material.
7. Thermal soil disinfection at 90^0 C for ten minutes reduced the attack of mycoses.

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